

**Instructions:** Upload LEGIBLE, COMPLETE solutions to Gradescope before 11:59pm on 10 November 2021.

1. Compute  $\iiint_R y \, dV$  for  $R = \{(x, y, z) : 0 \leq x \leq 3, 0 \leq y \leq x, x - y \leq z \leq x + y\}$ .
2. Consider the solid region  $R$  bounded by the paraboloids  $x = y^2 + z^2$  and  $x = 8 - y^2 - z^2$ .
  - (a) Set up (but do not evaluate) an integral for the volume of  $R$  in **Cartesian coordinates**.
  - (b) Set up (but do not evaluate) an integral for the volume of  $R$  in **cylindrical coordinates**.
  - (c) Set up (but do not evaluate) an integral for the volume of  $R$  in **spherical coordinates**.
  - (d) Compute the volume of  $R$  via any of the integrals you wrote out above.
3. Compute  $\iiint_R \sqrt{y^2 + z^2} \, dV$  for  $R$  the region inside the cylinder  $y^2 + z^2 = 16$  between  $x = -2$  and  $x = 5$ .
4. Compute  $\iiint_R x \exp(x^2 + y^2 + z^2) \, dV$  where  $R = \{(x, y, z) : x^2 + y^2 + z^2 \leq 1, x \geq 0, y \geq 0, z \geq 0\}$ .
5. Use transformation  $u = xy, v = xy^2$  to evaluate  $\iint_R y^2 \, dA$  where  $R = \{(x, y) : 1 \leq xy \leq 2, 1 \leq xy^2 \leq 2\}$ .